

Realizing Life Cycle Cost Savings Through Standardization



VIRGINIA (SSN 774) Class Program
Office

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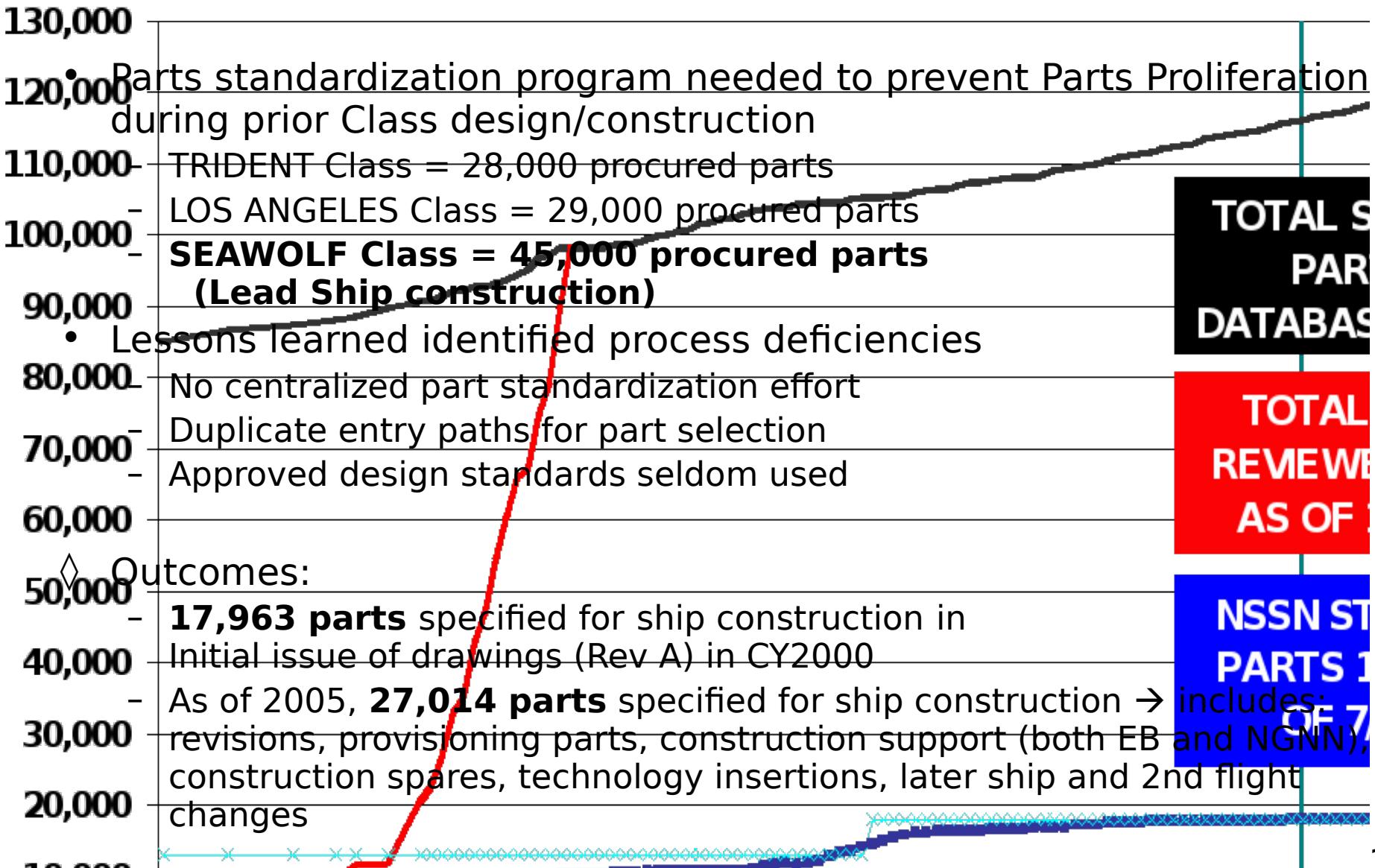
Overview

- Standardization embraced early in design phase
 - Parts Standardization for ship construction
 - Standardized products and processes used across Logistic Support Elements
- Parts Standardization
 - Empowered Design teams
 - Requirements and procedures
 - Database architecture
- Reducing Lifecycle Cost While Maintaining Performance
 - Spares Support
 - Training Support
 - Technical Data Support
 - Maintenance Processes





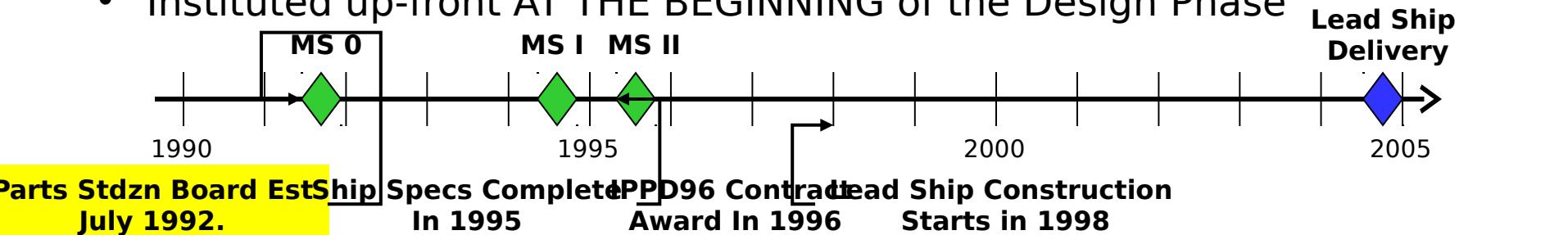
The Need for Parts Standardization





Early and Focused Effort Maximizes the Impact Of Parts Standardization

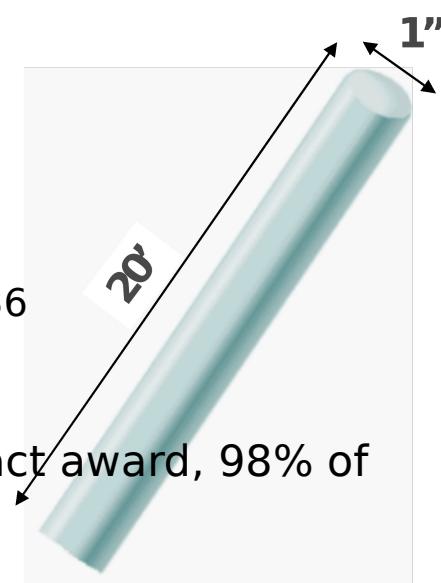
- Instituted up-front AT THE BEGINNING of the Design Phase



- Concerted effort thru IPPD & teams at shipbuilder and program office
 - Parts Standardization Board
 - Part Standardization Modeling Group
 - Design/Build Teams

Outcomes:

- Parts proliferation prevented, for example:
 - Bar, round, High Strength Steel, 1.000 Dia, MIL-S-22698 AH36
 - Prior class(es) allowed 9 P/Ns to satisfy
 - NSSN/VIRGINIA Class specifies one (1) P/N
- At time of the NSSN/VIRGINIA Class construction contract award, 98% of Standard Parts Library was “procurement ready”



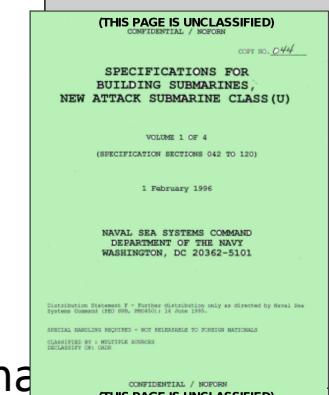
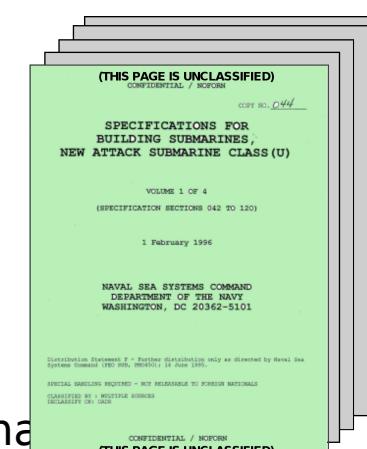
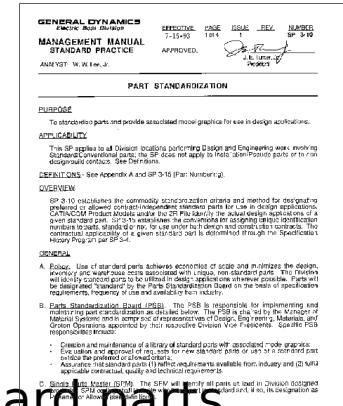


Management Commitment and Contractual Requirements are Key

- Part Standardization Standard Practice signed and supported by Shipbuilder President
 - Sets policy and procedures at Design Yard “to standardize parts and provide associated model graphics for use in design applications.”
- Shipbuilding Specification (Section 070) directs standard parts
 - “...the Design Yard shall identify standard parts to be utilized in design applications via the establishment of a dedicated Part Standardization Review Board ...”
- Program Office participation and support is key

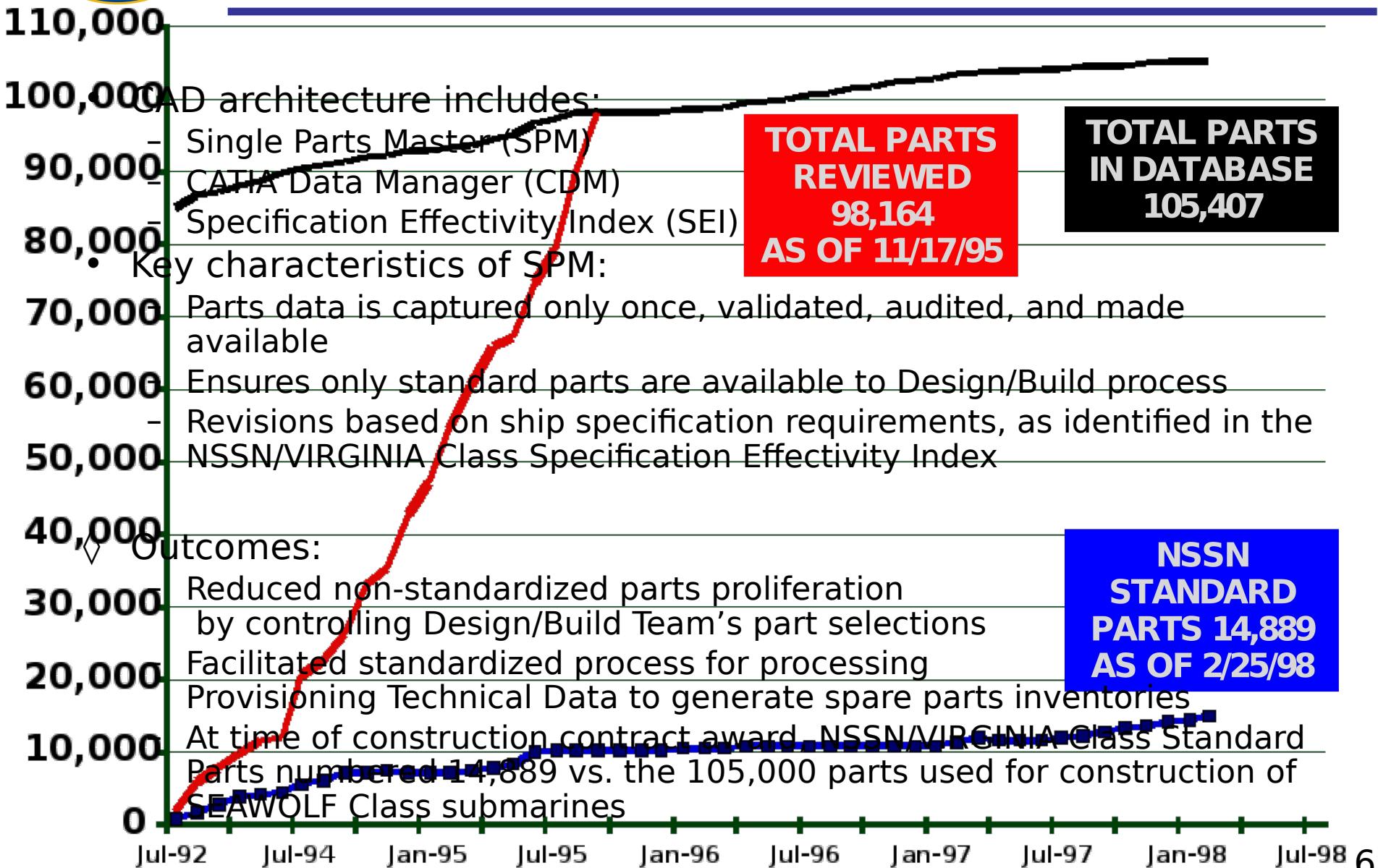
◊ Outcomes:

- Parts Standardization tracked as a technical performance metric
- Program office cognizant of benefits realized from standard parts
- Costs mitigated for design changes, even with new technology or new equipment, as they may contain ancillary equipment using standard parts



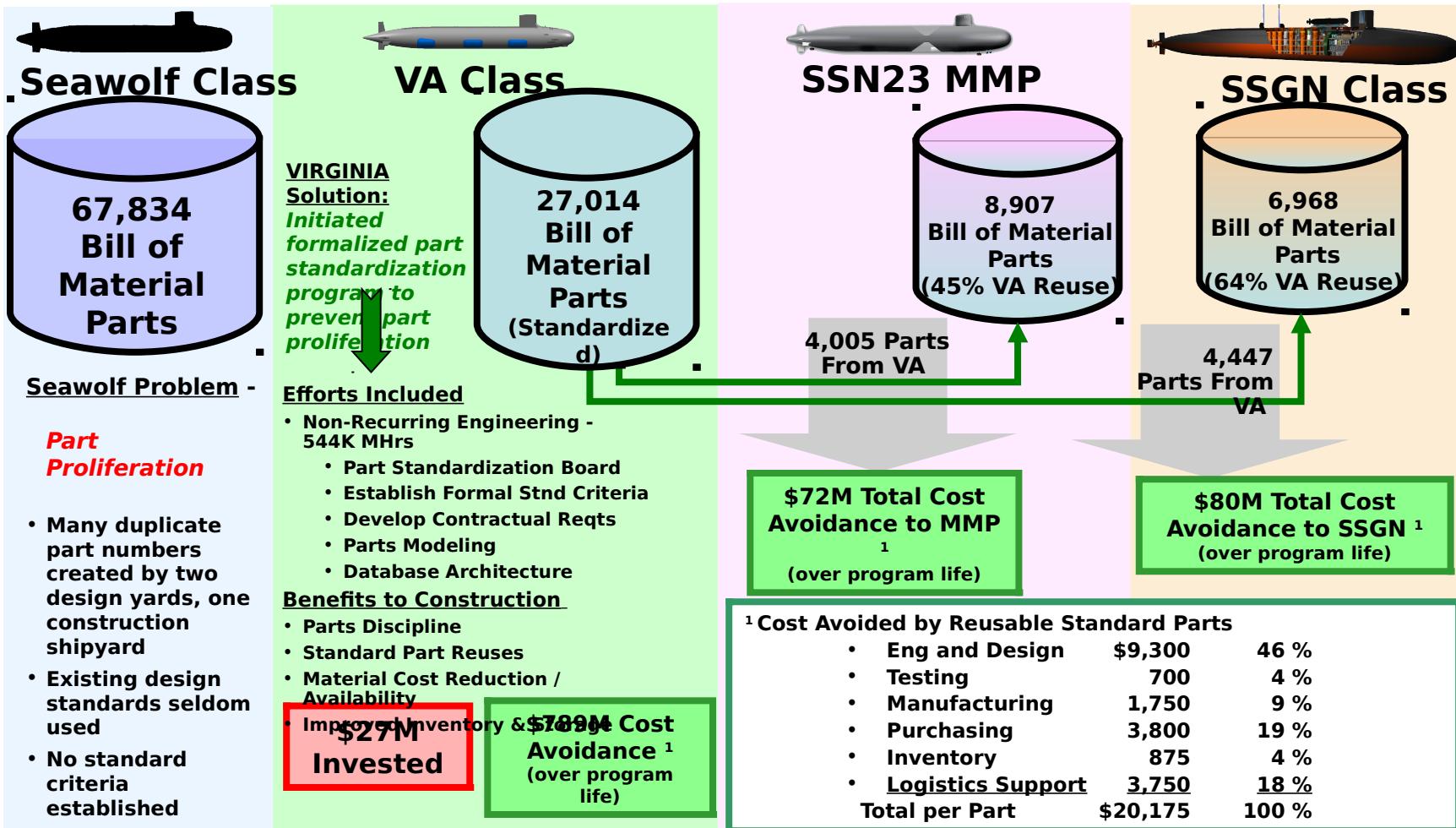


Parts Standardization Facilitated by CAD Architecture





Parts Standardization Cost Benefit to Submarine Programs



NSRP's \$3M CPC investment deployed the tools in other yards and Navy programs - and to NAVICP if desired.

Note: Cost Avoidance of \$20K per part based on DLA Parts Standardization and Management Committee study, "Reduced Program Cost Thru Parts Mgmt," 2002



Major Cost Savings Reaped from Minor Standardization Investment

Results

- SECNAV recognized the NSSN Program for saving \$500M in design & initial procurement costs (in 1997, before lead ship construction contract)
- Parts proliferation halted
 - SEAWOLF Program Bill of Materials number of parts at 67,834
 - VIRGINIA Class standardized Bill of Materials parts at 27,014.
- Significant cost savings/return on investment reaped
(for \$27M invested the expected cost avoidance is \$789M)
- Reduced parts libraries and projected savings due to cost avoidance realized for downstream submarine shipbuilding programs, SSN 23 MMP and SSGN by applying principles, lessons learned, and expertise
 - MMP: 8,907 Bill of Materials parts - 4,005 (45%) re-use of VIRGINIA Class parts; \$72M cost avoidance
 - SSGN: 6,968 Bill of Materials parts - 4,447 (64%) re-use of VIRGINIA Class parts; \$80M cost avoidance



Standardizing System Supportability Contained Costs & Improved Support

- NSSN/VIRGINIA Class Life Cycle Costs Reduced While Performance of Logistics Support Elements Maintained
 - Spares Support
 - Standardization through modeling processes
 - Training Support
 - Standardized training materials
 - Technical Data Support
 - Standardized Technical Documentation presentation
 - Maintenance Processes
 - Standardized Test Equipment and maintenance philosophy





VIRGINIA Initiatives to Reduce Costs While Maintaining Capability: Sparing

- Sparing Processes:
 - Reliability Based Sparing (RBS) Methodology for Critical Systems-
 - Standardized method of computing critical on board repair parts based on Single Point of Failure criteria and desired system reliability
 - Used for both Government and Contractor furnished equipment
 - Parts Standardization in design contributed to reduced number of required on board spares
- Outcomes:
 - USS VIRGINIA had 98.4% (of over 8600 computed parts) of all her required onboard spare parts when she was delivered, a number which significantly exceeded the required 97%, and far superior to the provisioning of any other lead ship
 - Reduced the overall number of spares carried while maintaining necessary organic repair capability to remain on station



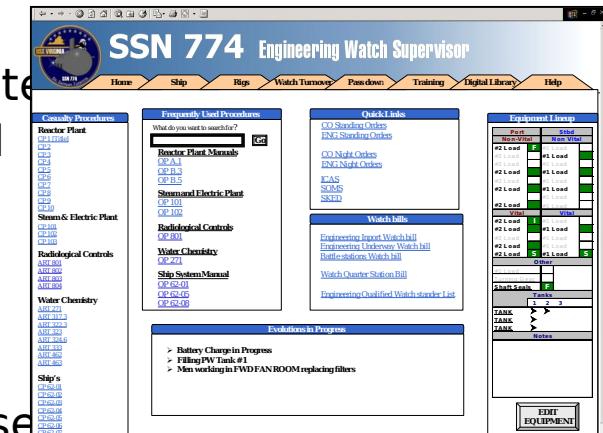
VIRGINIA Initiatives to Reduce Costs While Maintaining Capability: Training Support

- Training Development Processes:
 - SCORM Compliant Interactive Electronic Qualification and Training
 - Standardized VIRGINIA Watchstation and Shipboard Qualification procedures across the Class
 - Standardized Instructional material to reduce or eliminate some shore-based training and substitute electronic teaching materials for more expensive shore-based trainers
 - Embedded Training – USS VIRGINIA's On Board Team Trainer
 - Standardized attack training using the warfighter's own organic equipment
 - Eliminates the need for shore-based Submarine Attack Trainers
- Outcomes:
 - Class electronic training products ready for immediate implementation in the Navy's selected Learning Management System as soon as it is selected, without significant additional time/funding required to update
 - Realized a cost avoidance of over \$1.4M, by using multiple commercial developers, and exploiting advances in commercial graphics technology



VIRGINIA Initiatives to Reduce Costs While Maintaining Capability: Technical Data

- Technical Data Processes
 - Standardized Interactive Electronic Technical Manual (IETM) browser view layouts for over 600 manuals (owned by many different organizations)
 - Significantly improved the crew's ability to assimilate into the all-electronic environment for their manuals - a first for submarines.
 - Standardized technical documentation, including all of the ship's drawings, is integrated with the supply ordering process and with IMI onboard training products for a truly multi-dimensional capability.
- Outcomes:
 - Improved crew knowledge over previous Classes
 - USS VIRGINIA is the 1st submarine to use all-electronic procedures & TMs
 - The VIRGINIA Class Non-Tactical Data Processing System (NTDPS) has become the Navy model for future ship and submarine classes
 - NTDPS is the model for SNADIS - the Shipboard Non-Tactical Application Delivery Interface System





VIRGINIA Initiatives to Reduce Costs While Maintaining Capability: Maintenance Support

- Reliability Centered Maintenance Philosophy
 - Standardized Maintenance Review methodology to reduce the amount of required maintenance without sacrificing operational availability
 - Could result in reduced manning requirements (studies in-process)
- Standard Test and Support Items
 - Ship Specifications standardized special tools and test equipment, and specify standardized Commercial-Off-the-Shelf (COTS) test equipment to improve operator understanding, and reduce support requirements
- Outcomes:
 - Decreased Organizational-Level maintenance actions vs. legacy Classes. Studies are underway to determine savings.
 - Reduced the number of meters and test gear required onboard, reducing logistics footprint and cost of test equipment procurement.
 - 101 Test Equipment items at a total procurement cost of \$550K per ship [32% reduction for test equipment procured for SEAWOLF Class submarines (148 items at a cost of \$600K in FY05 dollars)].



Cost Savings and Reduced Logistics Footprint while Maintaining Capability

Results

- Reduced Onboard Logistics Footprint
 - 32% reduction in on-board test equipment over previous classes
 - 10% cost savings per ship
- Integrated Digital Data Environment improves ease of use for Sailors
- Effect of VIRGINIA Class Maintenance Philosophy is currently being assessed against protracted potential manpower savings
- Standardized Class Training Products ready to support Navy Learning Management System



Wrap-up

- An effective standardization effort begins with program start
 - Philosophy applied throughout design, construction, & modernization
 - Shipbuilder management support and government participation are key
- Digital environments maximize the application of standardization
 - Links Design Yard to vendors, and maintenance and training activities
 - Standardizes products developed by vendors and development activities
 - Facilitates onboard training and support
 - Reduces volume of paper and footprint for logistics support onboard
- Benefits extend beyond the ship/product design/build effort, for example
 - Trainer and Training System efficiencies
 - VIRGINIA Class NTDPS influence on SNADIS
 - Other Classes implementing standardization processes
- Specific to the NSSN/VIRGINIA Class Program:
 - At Delivery, USS VIRGINIA was the best logistically prepared ship of any Class, based on INSURV Inspection
 - Standardization remains a key initiative in effort looking at reducing the cost of each follow-on ship by \$400M each